AgConnections

AGRICULTURAL SAFETY AND HEALTH

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NIOSH Agricultural Research Centers Update for Autumn, 2003

ASAE Expands Focus on Ergonomics

By John A. Miles, Member, ASAE
Ergonomics, Safety and Health Division

Three general ergonomic risk factors are both endemic and of highest priority throughout the agricultural industry. They are: lifting and carrying heavy loads (over 50 lb.); sustained or repeated full body bending (stoop); and very highly repetitive hand work (clipping, cutting). The heavy physical work, frequent bending and twisting, and awkward postures place farm workers at high injury risk.

For hired workers nationally, fruit and vegetable commodities account for more lost time injuries than any other agricultural commodity (NIOSH 1995). In studies of plant nurseries and vineyard operations in California, we found high rates of Musculo Skeletal Disorder incidence: 40 per 1000 workers in nurseries and 80 per 1000 workers in vineyards. These are reported injuries only, and are well above the rates targeted by the US Public Health Service in *Healthy People 2000* of no more than 338 per 100,000 workers.

INTERVENTION APPROACHES

The approaches that work best to reduce injuries involve a mix of strategies including specific hazard identification and elimination, use of multiple control strategies, and active worker involvement. Interventions aimed at reducing musculoskeletal injuries through changing only worker behavior, usually through training, have generally failed to show any statistically significant effect on injury incidence (NRC-IOM, 2001).

Ergonomic principles and methods have been applied successfully to analyze and redesign agricultural tools and machines. The engineering approach, drawn from intervention strategies in manufacturing, focuses on redesigning tools and work stations to reduce biomechanical risks related to lifting, repetitive tasks, awkward postures, etc. Successful interventions have been made in fruit, vegetable, packing house, and

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Understanding and Addressing Agricultural Work-Related Musculoskeletal Disorders

Susan S. Gustke, M.D., Director Southern Coastal Agromedicine Center

It is well known that agriculture is a very physical occupation where muscular aches and pains are often considered to be "part of the job". As one young farmworker said during an informational interview, "you mean, I am not supposed to be in pain all the time?" Field crop production workers are at high risk for work-related musculoskeletal disorders (Murphy 2003). The Bureau of Labor Statistics in 2001 reported the incidence rate for overexertion to be 42.5 per 10,000 agricultural crop production workers. Ergonomic interventions can provide educational, engineering and environmental solutions to help reduce the potential for strains and sprains that decrease a worker's productivity level and may lead to more serious injuries.

Research on ergonomics in agriculture is limited in comparison to manufacturing and other industries. Until a recent study conducted by Southern Coastal Agromedicine Center (SCAC) researchers (Costello, 2000), there have been no reports addressing the occurrence of work-related musculoskeletal disorders (WMSD) in crops important to the SCAC region: cucumbers, melons, peanuts, soybeans, sweet potatoes, and tobacco. Field crop production that supplies the fresh fruit and vegetable market requires a high level of product quality and specific packaging/labeling. Meeting these production and packaging demands often requires labor intensive harvesting, sorting and packing with worker exposure to either hot and humid field conditions or cold storage areas. Much of this manual labor occurs in awkward postures that are held for prolonged periods of time and are executed under extreme time pressures.

SCAC researchers are combining ergonomic, physical therapy and social science expertise to identify job tasks associated with high levels of WMSD and to develop ergonomic interventions to reduce the incidence and severity of WMSD. A "participatory" ergonomic research/intervention approach is being used that involves input from farmers and family members, farmworkers, agricultural experts and health care providers in both identification of the major stressors and design of ergonomic solutions. This "participatory" approach is expected to increase buy-in, resulting in more effective and sustainable solutions.

In the southern regions of the country particularly, heat stress is a major health concern, and increases risk of WMSD. Another SCAC research study is measuring the effects of different hydration protocols on worker response to heat stress in cucumber, melon, and tobacco harvesting. The heat stress study measures physiologic parameters, including body temperature, pulse, orthostatic blood pressure, and cognitive function in relation to actual field temperature/humidity/radiant heat and worker productivity. Farmer and worker participation in both studies has been enthusiastic. This "participatory approach" promises to enhance the success of future education and corrective intervention initiatives.

Health Tracking of Musculoskeletal Disorders Among Iowa Farmers

Dan Anton, PhD, PT, ATC
Great Plains Center for Agricultural Health

The Keokuk County Rural Health Study (KCRHS) is a population-based, prospective study of health status and environmental exposures of a large stratified random sample of residents in one rural Iowa County. One project of the Great Plains Center Research Core is *Health Tracking of Musculoskeletal Disorders Among Iowa Farmers*. While Bureau of Labor Statistics data offers some description of the extent and causes of MSDs, it excludes farming operations with fewer than 11 employees.

This study is among the few that have reported on the association between farming and MSDs, and the only study on the association between farming and carpal tunnel syndrome (CTS), where the outcome is directly assessed and quantified. Hand symptom diagrams and nerve conduction studies are performed on participants in the KCRHS. Other data collected concurrently from participant interviews supports investigation of occupational and non-occupational CTS risk factors. Existing data from 1640 adult interviews from 1994-1998 in Keokuk County are being analyzed to ascertain the prevalence of other MSDs (low back, shoulder, lower extremity) and associated risk factors.

The Orchard Ergonomics Pilot Study

Christine Mason, BA
Center Affiliation: Northeast Center

Improvements to existing apple harvesting equipment are being tested by the Northeast Center. The aim is to reduce injuries due to sprains and strains while improving picking comfort and efficiency.

Ergonomic risk factors to harvesters were identified after observing workers picking apples. Advisory teams (orchard owners, apple pickers, industry experts, and researchers) selected two improvements from a list of suggestions developed by the project Ergonomist.

After piloting the ideas (hip belt, padded suspension harness) with informal farmworker focus groups, prototypes were tested in randomized trials in orchards. Workers were observed using each improvement separately, using their own equipment (control), and then using both improvements combined. Observations assessed body posture, work task, and equipment usage every 45 seconds over 90-minute periods. Worker satisfaction data was obtained.

Workers found the improvements comfortable with minor adjustments to the design. Field posture analysis indicated workers spent on average 85% of an 8.5-hour workday in moderate/severe forward flexion or lateral bend. Lab data (assessing weight disbursement of the hip belt) showed major load reductions in those postures while wearing the hip belt.

Next step: Electromyography testing in both lab and orchard to measure force output of the shoulder and back muscles while wearing the innovations.

The Virtual Corset – A New Logger for the Ambulatory Assessment of Physical Exposures

Peter Johnson, PhD
Pacific Northwest Agricultural Safety and Health Center

The Virtual Corset, a new ergonomic research tool, is available for your use! Dr. Pete Johnson and his research team at Pacific Northwest Agricultural Safety and Health Center and Microstrain, Inc. have developed a new data logger to assess postural and vibrational exposures in agricultural workers.

This tool allows researchers to continuously collect data on workers at task over the course of single or multiple days. Studies using the Virtual Corset will better develop our understanding of the relationship between cumulative exposure of vibration and posture to musculoskeletal disorders.

The Virtual Corset measures both back flexion/extension and side-to-side bending simultaneously or, it can be programmed to measure limb rotation. The device is pager-sized so that it can be mounted on the sternum or upper back of the individual. The logger weighs only 6 ounces, has 1 Gigabyte of memory and contains a microprocessor so it is self-activating for passive data collection over several days. The large memory capacity of the logger makes the ambulatory collection of data possible where previously not practical (e.g. vibrational exposures where the collection of exposure data has to be performed at high sample rates).

Researchers who would like to try the Virtual Corsets can contact Dr. Pete Johnson at petej@u.washington.edu.

Arthritis Study

Steve Kirkhorn, M.D.
Midwest Center

Agriculture has been identified as an industry with statistically significant odds ratios of hip and knee osteoarthritis. Agricultural risk factors associated with arthritis include: tractor driving, years farming, milking, and heavy physical work before age 16. Other occupational risk factors include previous joint injuries, forceful and strenuous work, and frequent knee bending.

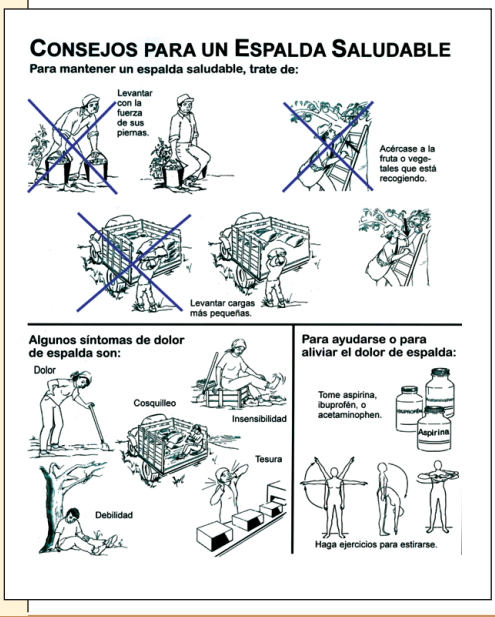
Epidemiological data evaluating chronic disease in the farm cohort from the Marshfield Epidemiologic Survey Area was used to determine physician diagnosis-based prevalence rates of osteoarthritis and allied disorders of arthropathy comparing farm to non-farm cohorts. Preliminary data indicate an increased age-adjusted prevalence rate ratio of osteoarthritis in the male farm cohort, decreased in the female cohort, and no overall statistically significant differences between the farm and non-farm cohort. Age adjusted prevalence rates of diagnosis based arthritis and allied disorders range from 11-15% in the cohorts compared to the 23% prevalence rate of physician-diagnosed arthritis in Wisconsin.

The NIOSH sponsored agriculture safety and health research centers engage in research, intervention/prevention, and education/outreach projects designed to respond to regional priorities, investigate issues with potential worker safety/health impact, and document effectiveness of measures to reduce risks and prevent injuries and disease among the agricultural worker population.

Other Center Updates

The Southeast Center Dr. Henry Cole, Professor of at the University of Kentucky's Southeast Center for Agricultural Health and Injury Prevention has been invited by NIOSH to present two papers at the October NOIRS in Pittsburgh. Both papers are part of different symposia series prepared by two different NIOSH research divisions, one at Pittsburgh and the other at Spokane. The titles of the two oral presentations are: "Effectiveness of Narrative Approaches to Occupational Injury Prevention Interventions" and "Work in Dynamic and Hazardous Environments: Where Does the Potential for Intelligent Performance Reside and How Is It Acquired?"

The Great Lakes Center is engaged in a new study to enumerate ROPS-equipped tractors and farm/farmer characteristics in Central Ohio. The Center is also assisting with the implementation of 1) a new OH law regulating lighting and marking for tractors with dual wheels and 2) the ASAE standards work on a Speed Identification Symbol (SIS) for tractors traveling at 40 mph or less. Through leveraged funds, the Center is conducting a safe tractor and machinery operation certification program and tracking those who are certified as part of a national program.



The Southwest Center
The National Center for Farmworker Health, a collaborative partner with the Southwest Center, assembled an advisory group of occupational physicians, migrant farmworkers and their advocates, and health educators to develop a low-literacy, bi-lingual educational handout. The information is available in both poster size and letter size primarily distributed to and through Community and Migrant Health Clinics. Call NCFH (512) 312-2700 to order.

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nursery settings. Despite the success of engineering interventions in reducing musculoskeletal symptoms and disorders, other aspects of job design and work environments may yield opportunities for intervention - either in concert with engineering or in situations where engineering interventions may be too expensive or difficult to apply. Where we have been unsuccessful in developing practical tools to reduce risks we have successfully reduced risks through rest break interventions.

ASAE HAS A NEW DIVISION!

By Dr. Malcolm Legault, ESH-01 Secretary

During the 2003 Annual Meeting of the American Society of Agricultural Engineers (ASAE), a new division, Ergonomics, Safety, and Health (ESH), was formed. Safety committees have been part of ASAE since 1954 and have continued to evolve by increasing the scope of activities. In 1994, the Safety and Health Technical Committee joined with the Human Factors Committee to form the Ergonomics, Safety, and Health Technical Committee, T-15. Some of T-15's activities include: management of 12 standards and input into many others designated as having major ergonomics, safety, and health content; sponsoring at least one technical session at annual meetings for over 30 years; and the establishment and management of the primary refereed journal in our field, read worldwide, The Journal of Agricultural Safety and Health (JASH). These activities involve the efforts of over 70 ASAE members who work for manufacturers, governmental agencies, universities, and/or farms.

The ASAE has acknowledged this critical mass by promoting the T-15 group to division status comprised of several committees:

ESH-01 Executive/Steering Committee Chair—Mr. Ronald McAllister;
ESH-02 Policy and Forward Planning Chair—Dr. Dennis Murphy;
ESH-03 Standards Chair—Mr. Terry Loughrin;
ESH-04 Technology Exchange, Chair—Mr. Eric Hallman;
ESH-05 Nominations Chair—Dr. David Hard.

To become involved with the Ergonomics, Safety, and Health Division of The American Society of Agricultural Engineers, please contact ASAE at 2950 Niles Road, St. Joseph, MI 49085 or call 269-429-0300.

NIOSH
National Institute for Occupational Safety and Health

Agricultural Research Center Initiative Centers funded as of October 1, 2001

Great Lakes Center for Agricultural Safety and Health
Ohio State University
590 Woody Hays Drive
Columbus, OH 43210
(614) 292-9455
Center Director: Thomas Bean, EdD

Great Plains Center for Agricultural Health
100 Oakdale Campus, #124 IREH
The University of Iowa
Iowa City, IA 52242-5000
(319) 335-4887
Center Director: Wayne Sanderson, PhD, CIH

High Plains Intermountain Center for Agricultural Health & Safety
154 B Environmental Health Bldg.
Colorado State University
Fort Collins, CO 80523-1681
(970) 491-6151
Center Director: Steve Reynolds, PhD, CIH

Midwest Center for Agricultural Research, Education & Disease & Injury Prevention
National Farm Medicine Center
1000 North Oak Avenue
Marshfield, WI 54449-5790
(715) 389-4012
Center Director: Anne Greenlee, PhD

Northeast Center for Agricultural Safety & Health
One Atwell Road
Cooperstown, NY 13326
(607) 547-6023
Center Director: John May, MD

Pacific Northwest Agricultural Safety & Health Center
Department of Environmental Health
Box 357234
University of Washington
Seattle, WA 98195-7234
Center Director: Richard Fenske, PhD, MPH
(206) 685-8962

Southeast Center for Agricultural Health and Injury Prevention
Department of Preventive Medicine
University of Kentucky
1141 Red Mile Road, Suite 102
Lexington, KY 40504-9842
(859) 323-6836
Center Director: Robert McKnight, MPH, ScD

Southern Coastal Agromedicine Center
East Carolina University
West Research Bldg., 1157 VOA Site C Road
Greenville, NC 27858
(252) 744-1000
Center Director: Susan S. Gustke, MD

Southwest Center for Agricultural Health, Injury Prevention and Education–The University of Texas Health Center at Tyler
11937 U. S. Hwy. 271
Tyler, TX 75708-3154
(903) 877-5896
Center Director: Jeffrey L. Levin, MD, MSPH

Western Center for Agricultural Health & Safety
University of California at Davis
One Shields Avenue
Davis, CA 95616-8757
(530) 752-5253
Center Director: Marc Schenker, MD, MPH

NIOSH Program Office
1095 Willowdale Road, MS: H2900
Morgantown, WV 26505
(304) 285-5836
Sr. Scientist for Agriculture: Steve Olenchock, PhD
Program Liaison Officers: Greg Kullman, PhD
Teri Palermo, RN

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LOGGING IN
VALUABLE RESOURCES

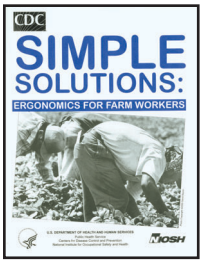
Elements of Ergonomics Programs, DHHS (NIOSH) Publication No,97-117

OSHA Names National Advisory Committee on Ergonomics (NACE).
Carter J. Kerk, PhD, PE, CSP, CPE
OSHA NACE, Chair
Associate Professor
Industrial Engineering Program
South Dakota School of Mines & Technology
(605) 394-6067
carter.kerk@sdsmt.edu

NIOSH Ergonomic and Musculoskeletal Topic page:
http://www.cdc.gov/niosh/ergopage.html

http://www.osha.gov/SLTC/youth/agriculture/index/html

Communications Guide for Media
http://www.cdc.gov/nasd/docs



Simple Solutions, DHHS (NIOSH) Publication No. 2001-111

Available in English or Spanish

LATEST CATCH
HOT TOPICS

Agricultural Safety & Health Conference Announced
The 2004 National Symposium on Agricultural Health & Safety is being planned. Representatives from the NIOSH Agricultural Research Centers, the National Institute for Farm Safety, and the North American Agromedicine Consortium are jointly planning a combined organizational conference. The conference schedule will offer plenary sessions for all conference participants, joint workshops, as well as tracks specifically addressing individual organizational priorities.

The Conference will be held **June 20-24,** 2004 at the Keystone Resort in Colorado. The call for abstracts is expected to be released in October with mid-February submission deadline.

The High Plains Center (HI-CAHS) is taking the lead to coordinate the conference. Contact Dr. Vicky Buchan *Buchan@cahs.colostate.edu*, or Cheryl Skjolaas, Administrative Director, NIFS *nifsad@tds.net*, or Dr. Steve Kirkhorn, North American Agromedicine Consortium, *kirkhorn.steven@mcrf.mfldclin.edu* for more information.

The University of Texas Health Center at Tyler
11937 US Highway 271
Tyler, TX 75708-3154

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